



THE IMPORTANCE OF MAINTENANCE OF MEDICAL EQUIPMENT IN HEALTH FACILITIES

Faisal. K. Albrkati^{1*}, Mohammed. S. Simsim², Mazen. M. Bagazi³, Abdullah. A. Basheikh⁴, Yasser. J. Logby⁵, Hussam. H. Majrshi⁶, Khaled. M. Alghamdi⁷, Aqeel. A. Hamiduddin⁸, Naif. M. Albalawi⁹, Ahmad. H. Alloqmani¹⁰,

Abstract:

The aim of this study is to know what is the maintenance of medical devices in health facilities, the importance of maintaining all types of medical devices, and the importance of training technicians and specialists by the company so that they are ready. The importance of regular maintenance of these devices. this questionnaire was distributed to social networking groups WhatsApp, where 600 answers were obtained from a total of 700 questionnaires.

Keywords: maintenance, Equipment, health facilities

^{1*}Medical device specialist in the executive administration of hajj and umrah at Mecca health cluster

²Medical device specialist in the executive administration of hajj and umrah at Mecca health cluster

³Medical device specialist in the executive administration of hajj and umrah at Mecca health cluster

⁴Medical device specialist in the executive administration of hajj and umrah at Mecca health cluster

⁵Medical device specialist in Health affairs compliance department in Mecca

⁶Medical device specialist in king a Faisal hospital, Mecca health cluster

⁷Medical device specialist in the Equipment at health Affairs in Jeddah

⁸Medical device specialist at the General administration of Equipment

⁹Medical device specialist at the General administration of Equipment

¹⁰Medical device specialist at the support department of health affairs in Mecca region

***Corresponding Author:** - Faisal. K. Albrkati

*Medical devise specialist in the executive administration of hajj and umrah at Mecca health cluster

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Introduction:

A medical device is any device designed for medical use. Therefore, what does the medical device cause about the medical device, it uses hydro. Medical devices contain useful advice by helping healthcare providers treat patients, diagnose them, know patients about detecting illness or disease, and of course their lives. The great potential for future developments in the use of medical devices, Therefore, the safety and effectiveness of medical devices must be proven with reasonable assurance before governments allow the marketing of the device to be regulated in their country. As a general rule, as the risks associated with the device increase, the amount of testing required to determine safety and effectiveness also increases. A biomedical engineer/equipment technician/Technologist or Biomedical Engineer/Equipment Technician is an electrical and mechanical technician or technical expert whose primary job is to ensure that medical equipment is maintained, functioning properly, and operated safely. In healthcare settings, biomedical equipment technicians work or are known as clinical and/or biomedical engineers, as there is no clear legal distinction within their field between engineers, technical experts, or technicians ⁽¹⁾. Biomedical equipment technicians are employed in hospitals, clinics, private sector companies, and the military. Their job is to install, inspect, maintain, repair, calibrate, modify, and design medical equipment and support systems according to recommended medical standards. Biomedical equipment technicians perform other tasks as well, such as teaching, training, and advising employees and agencies on how to operate and operate. The safe clinical application of medical equipment that maintains patient care and the safe handling of medical staff equipment. Senior, experienced biomedical technologists perform the formal portion of the work other than repairs and maintenance, such as capital asset planning, project management, budgeting, personnel management, interface design, medical systems integration, and training end-users of the devices in their correct use. An evaluation of new devices. Biomedical equipment technicians gained widespread acceptance in the private sector in 1970, following an article by consumer advocate Ralph Nader. Nader wrote: At least 1,200 people are electrocuted every year, and many more lose their lives or are injured in hospital accidents. It is unnecessary and can be avoided ⁽²⁾. Maintenance strategies and reliability engineering techniques have been significantly improved in the last two decades, and they have been successfully applied in many industries to improve the performance of

equipment. Maintenance management. Numerous inspection and optimization models are developed and widely used to achieve maintenance excellence, i.e., the balance of performance, risk, resources, and cost to reach an optimal solution. However, most of hospitals and healthcare organizations do not benefit from maintenance excellence as much as other industries ⁽³⁾. Unnecessary and excessive preventive maintenance could be also loss-making likewise inadequate level of maintenance. The time, that is spent doing unnecessary preventive maintenance, is robbing an organization of a fraction of one of its most vital resources ⁽⁴⁾. Since 2004, when the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) introduced standard EC.6.10 ⁽⁵⁾, hospitals in the US have started adopting their maintenance programs to put their maintenance resources where most needed. This standard allows hospitals to not schedule inspection or maintenance tasks for certain pieces or types of medical equipment if these tasks are not needed for safe and reliable operation ⁽⁶⁾. However, in Canada, most, if not all healthcare organizations include all their medical equipment in their maintenance program and just follow manufacturers' recommendations for preventative maintenance ⁽³⁾. Current maintenance strategies employed in hospitals and healthcare organizations have difficulty identifying specific risks and applying optimal risk reduction activities ⁽⁷⁾. Moreover, even though the use of reliability engineering tools is well established, their application to the medical industry is new. Most research in this area merely suggests how to assess or improve the reliability of devices in their design or manufacturing stages. To this point, the best maintenance strategies for medical equipment in their operating context have not been considered. Hospitals, due to possessing a large number of different devices, can benefit significantly if the optimization techniques are used properly in the equipment management processes. In this paper, we address these gaps and review the research literature regarding medical device inspection and maintenance. We consider various important aspects, concerned with MEIM including prioritization of medical equipment, maintenance optimization models applied for medical devices, maintenance outsourcing, and current MEIM policies applied in hospitals for improving medical equipment maintenance. Finally, in the discussion and conclusion section, we present the main research gaps found and suggestions for future research which will be the starting point for developing tools suitable for better medical device management.

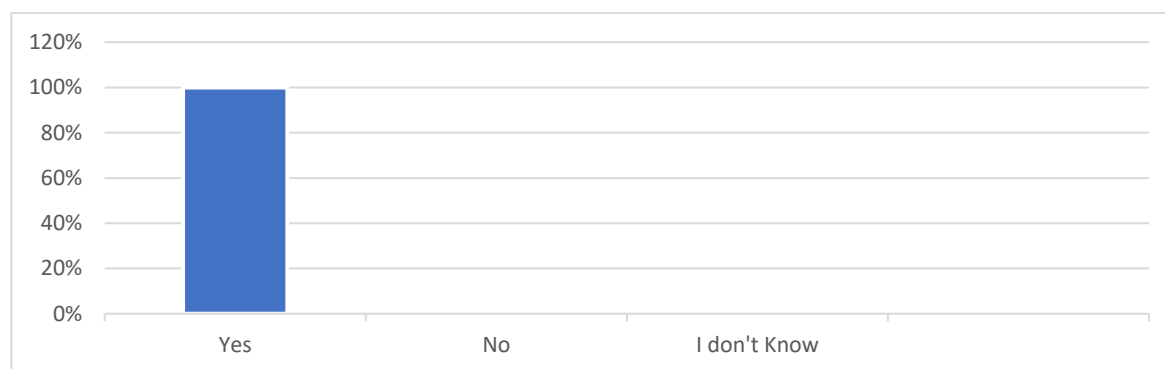
2-Material and Methods:

This study started in (the holy city of Mecca in Saudi Arabia), began writing the research and then recording the questionnaire in April 2023, and the study ended with data collection in September 2023. The researcher used the descriptive analytical approach that uses a quantitative or qualitative description of the social phenomenon (The importance of maintenance of medical equipment in health facilities), this kind of study is characterized by analysis, reason, objectivity, and reality, as it is concerned with individuals and societies, as it studies the variables and their effects on the health of the individual, society, and consumer, the spread of diseases and their relationship to demographic variables such as age, gender, nationality, and marital status. Status, occupation⁽⁸⁾, And use the Excel 2010 Office suite histogram to arrange the results using: Frequency tables Percentages⁽⁹⁾. A questionnaire is a remarkable and helpful tool for collecting a huge amount of data, however, researchers were not able to personally interview participants on the online survey, due to social distancing regulations at the time to prevent infection between participants and researchers and vice versa (not coronavirus participation completely disappearing from society). He only answered the questionnaire electronically, because the questionnaire consisted of thirteen questions, all of which were closed He only answered the questionnaire electronically, because the questionnaire consisted of thirteen questions closed, all of which were closed. The online approach has also been used to generate valid samples in similar studies in Saudi Arabia and elsewhere⁽¹⁰⁾

3- Results:

As for the ages of the participants in response to the research questionnaire, they were as follows: 25-34 years old was 11.1%, from 35-44 years old it was 74.1%, from 45-54 years old it was 14.8%, from 55-60 years old it was 0%. As for the gender of the participants, they were 89.3% men and 10.7% women. As for their nationalities, they were 82.1% Saudis and 17.9% non-Saudis. As for educational status: the majority of them held a bachelor's degree at a rate of 82.1%, then a master's degree at 10.7%, a diploma at 7.1%, intermediate, primary, and secondary certificates, and a doctorate at 0%. Regarding the first question: Is regular maintenance of medical devices important, in your opinion? The answer was 100% yes. As for the second question, is the maintenance

performed on medical devices customized? Yes 57.1%, No 39.3%, I don't know 3.6%. Regarding the third question: Is maintenance on medical devices carried out according to scheduled dates agreed upon by the company? The fourth question: Is maintenance required for all medical devices? The answer was the same: yes 89.3%, no 10.7%, and I don't know 0%. The fifth question was about Whether is maintenance related to applying quality standards to medical devices. The answers were as follows: 96.4%, No 3.6%, I don't know 0%. As for the sixth question: Are technicians or specialists adequately trained to maintain medical devices in health facilities? Yes 71.4%, No I don't know 14.3%. The seventh question: Are medical device technicians and specialists trained in advance before servicing these medical devices? The answers were the same as the previous question. The eighth question: Is the training period for technicians and specialists on medical devices sufficient for them to become familiar with how to repair them and their types? Yes 53.6%, No 21.4%, 25%. The ninth question: Is maintenance carried out periodically on medical devices in health facilities? Yes 92.6%, No 0%, I don't know 4.7%. The tenth question: Is there a special department for maintaining medical devices in health facilities? Yes 96.4%, No 3.6%, I don't know 0%. The eleventh question: Does the company that manufactures medical devices train technicians or specialists in medical maintenance? The answers were: Yes 71.4%, No 10.7%, I don't know 17.9%. The twelfth question: Is the medical maintenance department equipped with equipment and devices to maintain medical devices in medical facilities? Yes 78.6%, No 7.1%, I don't know 14.3%. The thirteenth question: What is the meaning of medical maintenance in medical facilities? The answers were mostly maintenance, which is performed to extend the life of the medical device or product and prevent malfunctions, constantly inspecting devices and repairing malfunctions, maintaining the safety of medical devices, maintaining medical device malfunctions, and troubleshooting malfunctions. The last question: What is the importance of maintaining medical devices? The answers were: very important, preserving property for as long as possible, ensuring that medical devices work with high efficiency, high accuracy and accuracy of results, increasing the efficiency of the device and giving accurate results, and preserving the life of the medical device.

Figure N0.1: The opinion of the participants in answering the research questionnaire about the importance of maintenance for medical devices**4-Discussion:**

This current study concludes the importance of medical maintenance and the extent of the readiness of medical maintenance specialist to maintain all medical devices, and that all specialists have received very adequate training and are prepared to maintain all medical devices.

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References:

- 1-"Electrical and Electronic Engineer". Occupational Outlook Handbook, 2012-13 Edition. Bureau of Labor Statistics, U.S. Department of Labor. Archived from the original on 2020-11-22. Viewed on 15/11/2014
- 2-Nader, Ralph (March 1971). "Ralph Nader's Most Shocking Exposure". Ladies Home Journal. C. 3: 176–179.
- 3-S. Taghipour, 2012, "Reliability and Maintenance of Medical Devices", Thesis.
- 4-Keil, O.R., 2008, "Unnecessary Preventative Maintenance: Its Effect on Opportunity Costs", JClinEng 33(1): 8.
- 5-Joint Commission on Accreditation of Healthcare Organizations (JCAHO), 2004, Hospital Accreditation Standards. Joint Commission on Accreditation: Oakbrook Terrace, IL.
- 6-Wang B, Fennigkoh and Smith, 2006a, "Model for inclusion criteria: 15-year retrospective. Interview with Larry Fennigkoh", JClinEng, 31 (1): 26–30.
- 7- Rice W., 2007, "Medical device risk based evaluation and maintenance using fault tree analysis" Biomed Instrum Techn 41:76–82.

- 8-Alserahy, Hassan Awad, et al (2008), The thinking and scientific research, Scientific Publishing Center, King Abdul-Aziz University in Jeddah, the first edition
- 9- Al Zoghbi, Muhammad and AlTalvah, Abas (2000), Statistical system understanding and analysis of statistical data, first edition, Jordan-Amman.
- 10-Kadasah, N.A.; Chirwa, G.C.; et al. Knowledge, Attitude, and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. Front. Public Health 2020, 8, 217.